DIFFERENTIAL RESPONSES OF PHENOTYPICALLY DIVERSE ENDOTHELIAL CELLS TO CYCLIC MECHANICAL DEFORMATIONS

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Endothelial cells lining the wall of a blood vessel are continually exposed to a changing hemodynamic environment. Evidence is accumulating that these physical forces can modulate endothelial cell phenotype and may influence the endothelial response to injury. EC exposed to cyclic strain exhibit marked changes in a multitude of responses including proliferation, orientation and secretion of macromolecules. Furthermore, the response of endothelial cells to cyclic strain is dependent on the vascular beds from which the cells are derived. For example, the proliferative rate and prostacyclin synthetic activity of bovine aortic endothelial cells are enhanced by cyclic strain in cells obtained from the thoracic aorta but not from pulmonary artery and vena cava. We are beginning to delineate the possible signal transduction pathways that may be involved in the contrasting responsiveness of endothelial cells derived from different vascular beds. For example, acute cyclic strain causes activation of phosphatidylinositol turnover, protein kinase C activity and adenylate cyclase activity in bovine aortic endothelial cells. Further study has demonstrated that strain-induced stimulation of adenylate cyclase leads to elevation of cyclic AMP accumulation and protein kinase A activity that corresponds to changes in the immunoreactivity of inhibitory G protein alpha subunit(s) in bovine aortic endothelial cells. However, in saphenous vein endothelial cells, no change in cyclic AMP accumulation was observed in response to cyclic strain. The precise signal transduction pathways that may be involved in mediating the differential response of endothelial cells to cyclic strain awaits further experimentation. In conclusion, the maintenance of endothelial cell phenotype and function is dependent on the hemodynamic milieu in vivo and may be influenced by the vascular origin of the cultured endothelial cells.

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